

BEDROCK CORE DRILLING: MINERAL EXPLORATION IN MINNESOTA



**IDEA
DRILLING**

TABLE OF CONTENTS

Message from the Company.....1

Diamond Core Drilling Process.....2

Exploration Drilling.....3

Frequently Asked Questions

IDEA Drilling LLC.....5

Mineral Exploration.....6

Drilling Operations.....9

Land Surface Owner Rights.....11

Minnesota Laws Relating to Exploration Drilling.....14

Drilling Laws and Regulations.....15

Environmental Laws and Regulations.....16

Additional Contact Information.....23



INDEX OF ABBREVIATIONS

BWCAW	Boundary Waters Canoe Area Wilderness
DNR	Minnesota Department of Natural Resources
EIS	Environmental Impact Statement
IDEA	IDEA Drilling LLC
MDH	Minnesota Department of Health
State	State of Minnesota
MPCA	Minnesota Pollution Control Agency
NNIS	Non-native Invasive Species



MESSAGE FROM THE COMPANY

The objective of this handbook is to provide factual information about how diamond core drilling is used to explore for buried mineral deposits and to explain the safeguards that are used to reduce, minimize or eliminate impacts to the environment from drilling. We hope to provide land owners, resort owners and other interested parties with some facts about the exploration drilling process, landowner rights and what to expect when mineral exploration core drilling occurs in your area.

IDEA Drilling LLC (IDEA) specializes in diamond core exploration drilling to obtain bedrock samples for our mineral exploration and mining customers. Exploration drilling is a step in the process of determining the quality and quantity of minerals present in the bedrock and is distinct from mining. Should a mineral deposit be discovered that is sufficient in size to be of interest for mining, a mandatory Environmental Impact Statement (EIS) must be prepared and numerous governmental permits must be obtained before a company could begin any mining activities. Minnesota has earned the reputation of having thorough and demanding environmental standards since passage of Minnesota's first Mineland Reclamation Act in 1969, which was before the Federal Clean Water Act. Minnesota exercises a comprehensive permitting process for mining. The EIS and permit processes require companies to publically disclose what is being proposed and provide numerous opportunities for public comment.


IDEA is committed to a safe workplace for our employees and to being environmentally responsible by employing practices that minimize, reduce or eliminate impacts to natural resources and the environment. Most of our employees and their families are long-time residents of Minnesota's Iron Range who enjoy outdoor activities such as hunting, fishing, hiking, canoeing and snowmobiling. IDEA wants to do its part to ensure that our employees return home from work safe and sound and our beautiful north woods and pristine lakes and streams are preserved and protected for generations to come.

To deliver on our commitment, we constantly strive to develop and implement business practices to ensure we meet all Federal and State environmental laws. In addition, IDEA has implemented practices that go beyond requirements, such as using liners under our rigs to capture any inadvertent spills and employing practices to reduce drilling noise far below State requirements. We expect all of our employees to comply with our environmental business practices and to identify ways to improve those practices.

We hope this handbook provides helpful information about the exploration drilling process and regulations that control its use. We intend to periodically update and improve the handbook and we encourage you to contact us at 218.741.9287 if you have any questions, comments or suggestions to improve this resource.



William D. Travis, President
IDEA Drilling LLC



Marty K. Vadis, Advisor to IDEA Drilling LLC
Retired Director, Minnesota Department of
Natural Resources, Lands and Minerals Division

NOTE: The drilling techniques and environmental safeguards described in this handbook draw mostly from State and Federal laws and rules and the practices used by IDEA Drilling LLC. This handbook does not intend to provide legal advice. Rather, the discussion of Federal and State of Minnesota (State) laws and rules in this handbook represents the interpretations of IDEA's management. Readers are encouraged to consult specific Federal and State laws and rules and/or legal counsel on all questions of a legal nature.

DIAMOND CORE DRILLING PROCESS

Steps in the Process

1. Drill holes begin with installing a pipe called casing from the surface through soils and sealed into bedrock.
2. Diamond core drilling uses a diamond bit, which rotates at the end of drill rod (or pipe) inside the casing.
3. The opening at the end of the diamond bit allows a solid column of rock to move up into the drill pipe and be recovered at the surface.
4. Most drill rods are 10 feet long. After the first 10 feet are drilled, a new section of pipe is screwed into the top end, so the combination of pipes can be drilled deeper into the ground.
5. The diamond bit is rotated with gentle pressure while being lubricated with water and drilling fluid to prevent overheating.
6. The driller adjusts rotation speed, pressure and water circulation for different rock types and drilling conditions.
7. Inside the drill pipe is a core tube, which has a latching mechanism attached to a cable. At the end of each 10 foot run, the cable is lowered to winch the core tube containing the new rock core to the surface where it can be recovered.
8. The drill core is stored in specially designed core boxes containing compartments to hold sections of the core.
9. The drill core is then logged and analyzed by a geologist.



EXPLORATION DRILLING

What is Exploration Drilling?

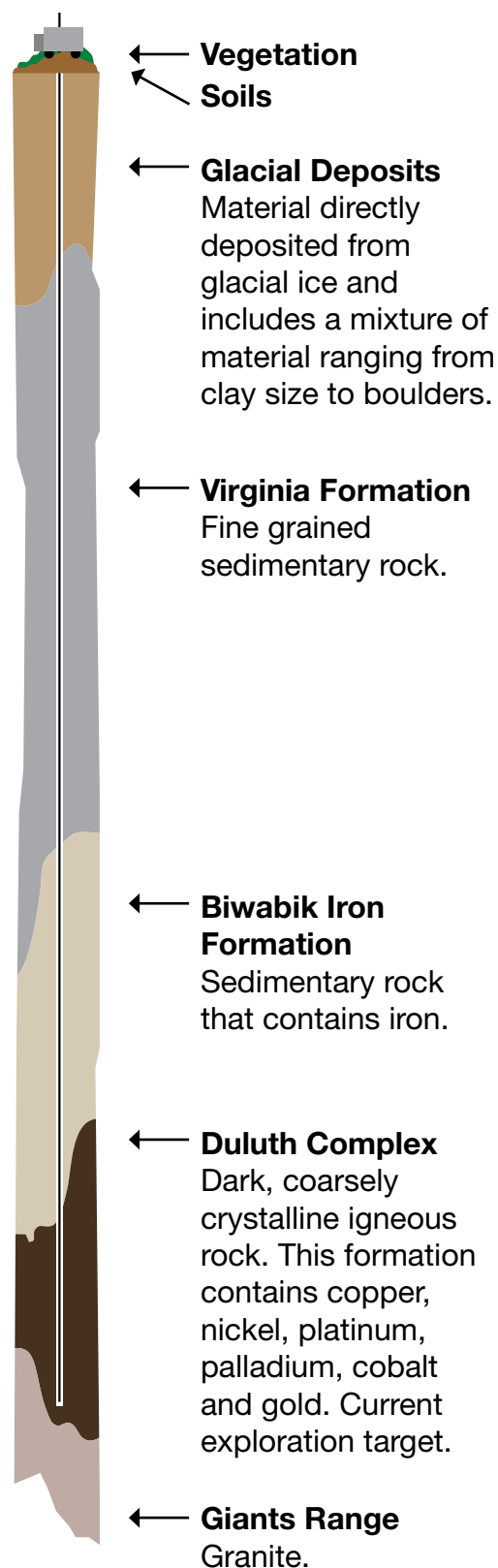
The purpose of exploration drilling is to obtain a continuous sample of the bedrock. The drill core sample is logged to define rock types, and portions are often sampled and chemically analyzed to help further characterize rock types and to look for the presence of economic minerals.

Each drill hole can encounter various types and thicknesses of soils, glacial till and rock types. The cross section on the right is typically seen in northeastern Minnesota.

Drilling

- Drilling typically occurs around the clock in two 12-hour shifts of two to three employees.
- Drill holes are generally 1,000 to 5,000 feet deep.
- On average, a 2,000-foot hole takes six to 10 days to drill.
- Core of about 2 to 3.5 inches in diameter is typically drilled.
- As of October 2012, IDEA has drilled more than 1,000 exploration holes in Minnesota.
- In 2011, IDEA drilled more than 700,000 feet of bedrock drill core.
- Sometimes this type of drilling is called diamond drilling because a diamond bearing drill bit is used to cut through the bedrock.

*Typical Hole Cross Section
(not to scale)*



Some Notes on Drilling

- Only Minnesota Department of Health licensed explorers (e.g., mineral exploration companies) can install exploratory borings.
- Diamond core drilling and water well drilling both bore holes into the earth, but the purpose, methods of construction and Minnesota rules that regulate the drilling are much different.
- Bore holes must have casing that is sealed into the bedrock to prevent surface water from entering aquifers.
- All exploratory borings must be sealed. Borings may be temporarily sealed to allow more data to be collected, but must be permanently sealed within ten years.
- Drilling fluids used to cool the drill bit and help remove cuttings from the hole must be State approved material to prevent groundwater contamination.
- Drill sites and access trails are reclaimed when drilling is complete.

TYPICAL CORE



TYPICAL DRILL RIG



RECLAIMED DRILL SITE



FREQUENTLY ASKED QUESTIONS

IDEA Drilling LLC

Who is IDEA Drilling LLC?

IDEA has provided exceptional core drilling and surveying services for more than a decade. Originally formed in 1997 in Montana, IDEA moved to Minnesota in 1999 and is a privately held business headquartered in Virginia, Minn. (see www.ideadrilling.com). IDEA provides:

- Diamond core drilling,
- Down hole survey services and
- The sale of other drilling and exploration-related products.

We continuously upgrade our drill rig fleet to provide the most current drilling technology available and to ensure safe, environmentally sound and efficient operations. We maintain a fleet of approximately 20 drill rigs, capable of drilling core holes up to 8,000 feet in depth and from approximately 1.89 inches to 4.82 inches in hole diameter.

Our customer list includes some of the most prominent mineral exploration and mining companies operating in the United States. We currently serve customer projects in Minnesota, the Upper Peninsula of Michigan, Wisconsin and other Southeastern and Western states. IDEA provides a strong culture of customer service excellence, which is founded on our drilling productivity, the quality of our work, and our commitment to safety, environmental stewardship and innovation.

Who do I talk to if I want a job drilling?

Core drilling is very demanding, physically strenuous and generally involves 12-hour shifts. However, it also provides great challenge, the ability to work outside and very good pay programs. If you are interested, you may complete an application on our website at www.ideadrilling.com.



INTERESTING FACT:

IDEA currently
employs approximately
130 people.

Mineral Exploration

Why do people want to drill core holes in the bedrock?

There are several reasons that bedrock core drilling is conducted. These include scientific research, such as a study by a university to obtain a sample of bedrock for use in mapping the bedrock geology. Bedrock samples are also obtained when conducting geotechnical analyses for foundations of bridges and large buildings. In northeastern Minnesota, bedrock drill holes are most often drilled by mineral exploration or mining companies as a method to evaluate the potential of the bedrock to contain mineable mineral resources. For whatever reason core drilling is conducted, obtaining a physical sample of the bedrock is the objective of the drilling.

What minerals are exploration companies looking for?

The bedrock encountered in a drill hole determines what types of minerals are present. Much of northeastern Minnesota is underlain by a dark, coarsely crystalline rock called the Duluth Complex gabbro. The most common metals being explored in northeastern Minnesota are copper, nickel, platinum, palladium, cobalt and gold, and these elements occur in the form of sulfide minerals such as chalcopyrite, pyrrhotite, pentlandite and others.

What are these minerals used for?

Below in Figure 1 is a summary of the average amount of minerals used over a lifetime. Some of the common uses for these minerals include:

- **Copper** - construction, plumbing, electric wiring, car batteries, wind turbines, cell phones and computers
- **Nickel** - stainless steel, rechargeable batteries and jet engines
- **Platinum & Palladium** - catalytic converters that reduce automobile pollution, jewelry and medical applications
- **Cobalt** - household magnets and hybrid vehicles
- **Gold** - jewelry, dental and medical applications, computers and electronics

The most common metals being explored in northeastern Minnesota are copper, nickel, platinum, palladium, cobalt and gold.

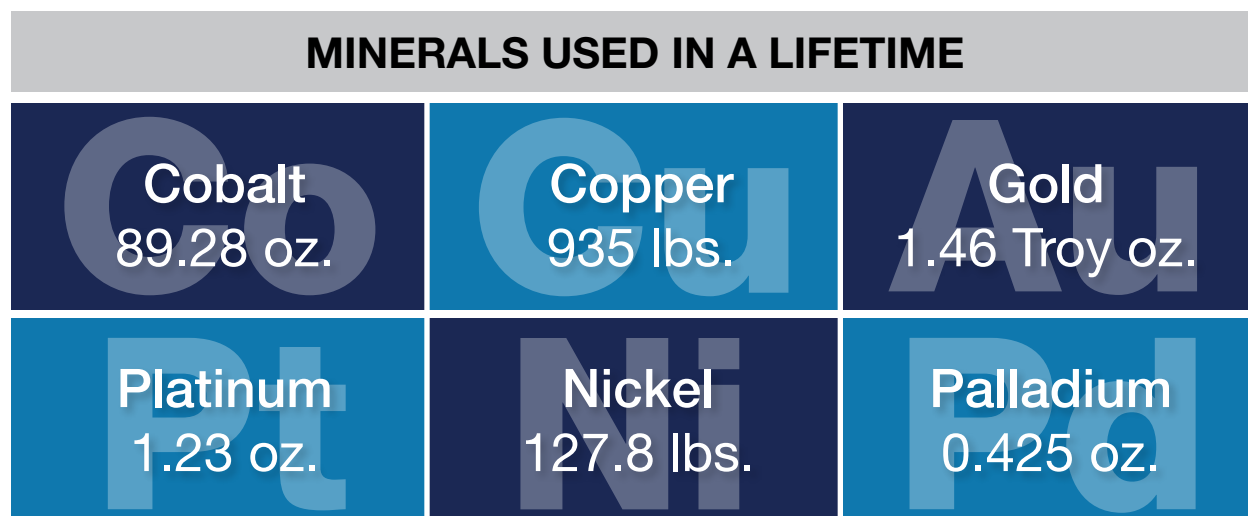


Figure 1: Data courtesy of the Iron Range Resources and Rehabilitation Board.

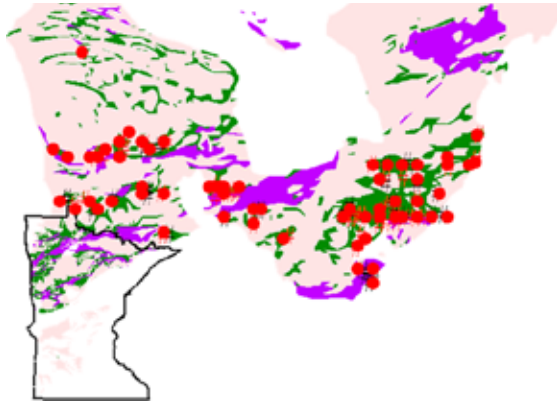


Figure 2: Canadian Shield bedrock showing mineral deposits.

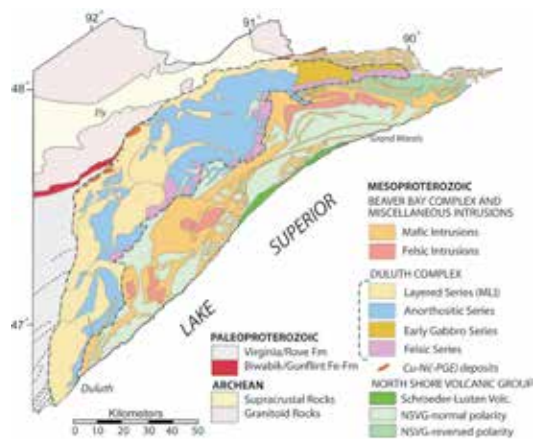


Figure 3: This map shows the bedrock geology of northeastern Minnesota along with the location of the iron and known copper-nickel deposits.

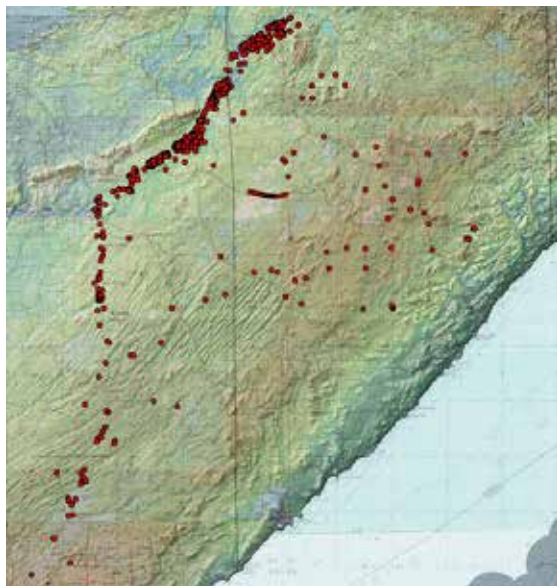


Figure 4: This picture shows the bedrock mineral exploration drilling that has been conducted in the Duluth Complex from 1960 through 2009. Each red dot represents a drill hole location.

How are sites selected for core drilling?

Geologists have learned that ore deposits of various types tend to occur in specific kinds of bedrock. For example, Figure 2 on the left shows the geology of the 2.7 billion-year-old geologic terrane of what geologists refer to as the Canadian Shield. Volcanic rocks in this terrane (shown in green) commonly host economic deposits of copper, zinc, lead and gold (shown by red dots). Thus, when exploring for similar deposits in Minnesota, explorationists will focus their search on the volcanic rocks and not on the granites (pink) and gneisses (purple) that also make up this terrane.

Most of northeastern Minnesota is made up of rocks formed 1.1 billion years ago during a prolonged period of magmatic activity. As shown in Figure 3 on the left as produced by Dr. James Miller, senior research associate of the University of Minnesota Duluth, this magmatism produces a thick pile of lava flows now exposed along the Lake Superior shoreline and thick intrusions of gabbro that are collectively termed the Duluth Complex. Along the northwestern margin of the Duluth Complex, where hot magmas were contaminated with sulfur by 1.8 billion-year-old sedimentary rocks of the Virginia Formation, extensive deposits of sulfide minerals rich in copper, nickel and precious metals were formed.

The map of the Duluth Complex shown in Figure 4 on the left shows the locations of bedrock drilling within the Duluth Complex from 1960 through 2009. In 1980, the Minnesota Department of Natural Resources (DNR) estimated 4.4 billion tons of copper-nickel mineral resources containing an average of 0.066 percent copper and 0.022 percent nickel from core drilling that had been conducted through that date. Since that time, more drilling has been conducted and the results indicate the mineral resource is substantially larger.

What are the chances that a valuable mineral deposit will be found?

Generally, a lot of geological research has to take place before a site is selected and, even then, the odds that a valuable mineral deposit will be found as a result of one exploration drill hole are very slight. Although the probability of finding a deposit worth mining in a previously unexplored area is low, the probability of intersecting economic quantities of minerals in areas extensively explored in the past, such as the known deposits in the Duluth Complex, are far greater. The drilling in these areas is aimed at refining deposit information and to look for additional deposits.

If a valuable mineral deposit is discovered, can a company begin mining?

The timeline from discovery to mining is many years, challenging and complex. Companies that are exploring have obtained leases on mineral rights, which provide the opportunity to explore for minerals, but do not give them the right to mine until they have successfully obtained all needed governmental permits (should they find a mineable deposit of minerals). In Minnesota, metallic mining requires a mandatory EIS. This is an exhaustive analysis of a proposed mine with public disclosure of what is being proposed and opportunities for public comments on the project. If a company successfully completes the environmental review process, numerous State, Federal, and local permits are needed, each requiring a public process and the opportunity for public comment. Only after obtaining each required permit, would a company begin to mine.





Drilling Operations

Can I find out where exploration companies will be drilling?

Yes. The location of each proposed drill hole must be publically disclosed prior to drilling. At least 10 days before beginning exploratory boring, an explorer must submit a map to the commissioners of the Minnesota Department of Health (MDH) and the DNR. This map can either be a county road map with a scale of 0.5 inch equal to one mile, as prepared by the Minnesota Department of Transportation, or a 7.5 minute series topographic map (1:24,000 scale), as prepared by the United States Geological Survey. These maps show the location of each proposed exploratory boring to the nearest estimated 40-acre parcel. Exploratory boring that is proposed on the map may not be commenced later than 180 days after submission of the map, unless a new map is submitted.

Anyone interested in learning more about this process or who would like to see these maps can contact either the DNR (Telephone: 218.231.8484) or the MDH (Telephone: 651.201.4600 or 800.383.9808).

Why do you drill around the clock?

Continuous drilling ensures the hole remains stable during the entire drilling process, whereas stopping and starting drilling a hole may sometimes result in some hole instability and caving.

Shutting the drill rig down during very cold weather can cause freezing of the equipment, resulting in inefficiency and sometimes damage.

Drilling productivity is much higher using two 12-hour shifts, since there is less time invested in starting up and shutting down equipment each day. Consequently, this schedule produces more core in a timely manner, is more cost-effective, reduces the overall time duration we are working at any one drill site and minimizes potential security concerns.

Some exploration sites are located in wetland areas. Drilling in wetlands is best accomplished during the winter when those areas have frozen to the point that drilling equipment is able to access the drill sites. The time period that these frozen conditions exist is very short, even in a cold winter.



What happens to the drill core?

IDEA immediately provides the core generated to the customer/explorer. The DNR mineral leasing rules require that explorers submit a portion of all core samples to the State on State-owned lands. In addition, Minnesota Statute 103I.605 requires drill core from all land, regardless of land ownership, be submitted to the State.

INTERESTING FACT:

The DNR Division of Lands and Minerals maintains a library of core samples in Hibbing, Minn., containing more than 2 million feet of mineral samples that are available for public inspection.

What does drill core look like?

Figure 5 below shows one box of bedrock drill core and represents about 10 feet of bedrock. The core can be drilled in various diameters. The core in the picture is about 2 inches in diameter and is the most common size drilled for mineral exploration.

Figure 5: Core extracted from a drill hole placed in a core box.



Can I visit a drill rig?

If you are interested in visiting a drill site to learn more about the process and equipment, please contact IDEA's office at 218.741.9287 and ask to speak to the president or vice president of operations. We will contact our customer to see if such a visit is possible. If that cannot be arranged, we will be happy to show you our equipment and to discuss the drilling process at our headquarters in Virginia, Minn.



Land Surface Owner Rights

Do I own the mineral rights associated with my land?

You may or may not own the mineral rights beneath your property. A severance of mineral rights may have been agreed to by previous owners of your property. A severance is a separation of the ownership of the underground minerals from the ownership of the surface of the land. Severed mineral rights can be owned independently of the ownership of the surface of the land.

There are several ways in which a severance may occur. Most commonly, mineral interests are retained upon sale of the land through language in the deed by the seller. Any severance of the surface and minerals rights would be noted in the title to the property. The title to the property contains the details of what mineral interests were severed. If no severances occurred in the past, then the minerals remain with the surface ownership. It should be noted that if your land went tax forfeited at some time in the past, the State (by law) reserves the mineral rights if the surface is subsequently sold by the State.

What regulations exist regarding the Boundary Waters Canoe Area Wilderness (BWCAW) and Superior National Forest?

Much of northeastern Minnesota is within the BWCAW or Superior National Forest. Both State and Federal law forbid mineral exploration within the BWCAW except in a national emergency.

Regulated mineral exploration is allowed in the Superior National Forest. An EIS was recently conducted within the Superior National Forest to identify and examine in detail five alternatives for Federal Mineral Prospecting Permits. Electronic versions of the Final EIS are available on the Superior National Forest website at www.fs.usda.gov/goto/superior/projects. Copies of the Final EIS can be obtained from the Forest Headquarters by calling 218.626.4300.

The alternative selected by the Forest Service includes stipulations that must be complied with to conduct exploration drilling. One example is to set a maximum noise level at the boundary of the BWCAW. Figure 6 below shows the U.S. Forest Service understanding of the level of interest of mineral exploration within the Superior National Forest.

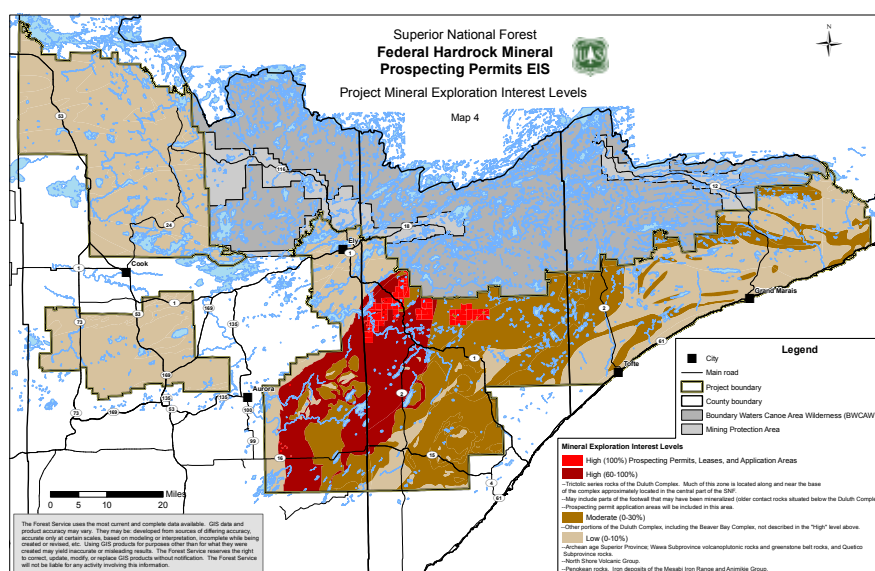


Figure 6: Level of interest in mineral exploration.

Can someone with a State mineral lease come on my land without notifying me?

No. The State mineral lease requires companies holding mineral leases to notify land owners. This requirement is in paragraph 25 of the State lease and reads as follows:

“Notice to owner of surface estate. When the leased premises do not include the surface estate, the lessee shall give notice, in writing, to the owner or administrator of the surface estate at least 20 days in advance of any activities which will require use of the surface estate on the leased premises. The notice shall sufficiently describe the activities to enable the owner or administrator of the surface estate to evaluate the extent of the use of the surface estate.”

Leases of State owned minerals require that a surface owner be compensated for any damages to the surface which occur due to exploration activities of the holder of the State mineral lease.

Do mining companies have eminent domain powers in Minnesota?

No, mineral exploration and mining companies do not have eminent domain powers in Minnesota directly.

It is somewhat complicated, but there is a process set up in Minnesota Statute 93.05 intended to apply to a situation where the State leases State-owned mineral rights that exist under surface land owned by someone else. This law states in part:

“... the holder of any mineral lease subsequently issued thereon may nevertheless enter upon the lands and prospect on the lands under the lease.”

The statute further states that the lease holder must pay the surface owner for all damages to the property. If the surface owner and lease holder cannot agree on a price, the lease holder can request the Minnesota Attorney General to proceed with condemnation of the surface. The commissioner of the DNR must approve proceeding with condemnation. With a history of more than 120 years of mining, we know of no instance where this has ever been done in the State of Minnesota.

INTERESTING FACT:

Sound mitigation measures on drill rigs can reduce the noise at 400 feet from a rig to be only about as loud as the refrigerator in your kitchen.

Do you need a road to get into drill sites?

Yes, although road building is minimized to the extent possible and existing trails are used, if available. Our drill rigs are either truck mounted or track mounted so the road development is dependent on the type of drill platform being used. In addition, a water truck and drill crew vehicles use the access road.

These drill roads and drill sites are intended to be temporary uses of the land with clearing of trees and vegetation minimized, erosion controls used and disturbed areas restored after drilling is complete. Drill roads are not intended for public access to the land, and measures to control access are used during drilling and roads decommissioned and blocked after drilling is complete. Wetlands are generally only accessed under frozen conditions.

INTERESTING FACT:

IDEA sometimes uses all-terrain vehicles to minimize rutting associated with accessing drill sites.



Minnesota Laws Relating to Exploration Drilling

What are Minnesota's laws for exploration drilling?

In 1980, Minnesota's legislature passed laws regulating exploration drilling and directed the MDH to write rules to regulate how drilling can be conducted. Referring to the drilling legislation, the legislature decided the intent of the law was as follows:

"... to protect the health and general welfare by providing a means for the development and protection of the natural resource of groundwater in an orderly, healthful, and reasonable manner."

In 1981, the MDH adopted the first set of rules to regulate the drilling of exploratory borings. Today, exploratory drilling is regulated under Minnesota Rules, Chapter 4727, and Minnesota Statutes, Chapter 103I. The rules detail requirements for both licensing of explorers and registration of drilling machines and the need for written notification to both the MDH and the DNR prior to drilling. The rules also regulate the construction and sealing (either permanent or temporary) of exploratory borings and include the requirement to submit sealing records to the MDH.

Who owns mineral rights in the State?

Mineral rights in Minnesota may be held by the property owner or by another person or company (severed rights). The DNR manages the State's mineral rights and leases. DNR rules require that mineral explorers submit a portion of all mineral core samples to the State, which are catalogued at the DNR Division of Lands and Minerals' library of core samples in Hibbing, Minn.

NOTE: Aerial photography by Dave Witt/Aero-Environmental Consulting, LLC.



INTERESTING FACT:

The State is the largest single owner of mineral rights in Minnesota, owning approximately 24 percent of all mineral rights.

Drilling Laws and Regulations

What is the State of Minnesota's policy for mineral development?

Minnesota's policy for mineral development is stated in Minnesota Statutes:

"93.001 POLICY FOR MINERAL DEVELOPMENT.

It is the policy of the state to provide for the diversification of the state's mineral economy through long-term support of mineral exploration, evaluation, environmental research, development, production, and commercialization."

Can anybody drill holes in Minnesota?

No. Minnesota regulates who can conduct exploration drilling in the State. Companies conducting exploration drilling in Minnesota must be licensed by the MDH and registered by the DNR. Each company must have a designated responsible individual who either passes a test given by the MDH or is a registered professional engineer or geologist in the State. In addition, drilling machines must be licensed by the MDH.

Is there a government agency that watches what drilling companies do?

Yes. There are several governmental agencies that can inspect what drilling companies do. This is required in Minnesota Statutes 103I.601, Subd. 5:

"Access to drill sites. The commissioners of health, natural resources, and the Pollution Control Agency, the community health board as authorized under section 145A.04, and their officers and employees shall have access to exploratory boring sites to inspect the drill holes, drilling, and sealing of the borings, and to sample ambient air and drilling waters, and to measure the radioactivity of the waste drill cuttings at the drilling site at the time of observation."

The DNR has made a practice of visiting drill sites to inspect and monitor drilling activities on nearly every hole drilled in Minnesota. The MDH also makes regular visits to drill sites as their workload permits. The typical inspection includes items such as:

- Verifying the drill hole location;
- Checking for current drill rig license decals;
- Documenting that drill additives comply with the law;
- Monitoring casing installation practices; and
- Verifying that either potable water or water treated to conform to State rules is being used in drilling operations.



Environmental Laws and Regulations

Is there a governmental agency that regulates drilling and protects groundwater?

Yes. The first law regulating mineral exploration drilling in Minnesota was passed in 1980, in part because of environmental concerns associated with exploration for radioactive minerals and interest in protecting Minnesota's groundwater. In 1981, Minnesota adopted the first set of rules to regulate the drilling of exploratory borings.

Today, exploratory drilling is regulated under Minnesota Rules, Chapter 4727, and Minnesota Statutes, Chapter 103I. The rules and statutes define the meaning of an exploratory boring and identify minerals or materials that are regulated. The rules detail requirements for both licensing of explorers and registration of drilling machines and the need for written notification to both the MDH and the DNR prior to drilling. The rules also regulate the construction and sealing (either permanent or temporary) of exploratory borings and include the requirement to submit sealing records to the MDH.

Are any chemicals or petroleum put down the hole?

No. IDEA, like all core drilling companies, uses drilling fluid down the hole to lubricate the drill bit and to remove drill cuttings from the drill hole. IDEA utilizes drilling fluid that meets the standards of National Sanitation Foundation Standard 60-1988, as required by Minnesota Rule 4727.

Furthermore, Minnesota law strictly regulates what can be placed in an exploration drill hole. That law states:

"Injection or disposal prohibited. An exploratory boring must not be used for injection or disposal of surface water, groundwater, or any other liquid, gas, or chemical."

The Commissioner of the MDH has the authority to suspend, revoke or impose limitations or conditions on a licensee for several reasons including noncompliance with state drilling laws and rules or conduct that is likely to harm the public or demonstrates a willful or careless disregard for the health or safety of a property owner or other person.

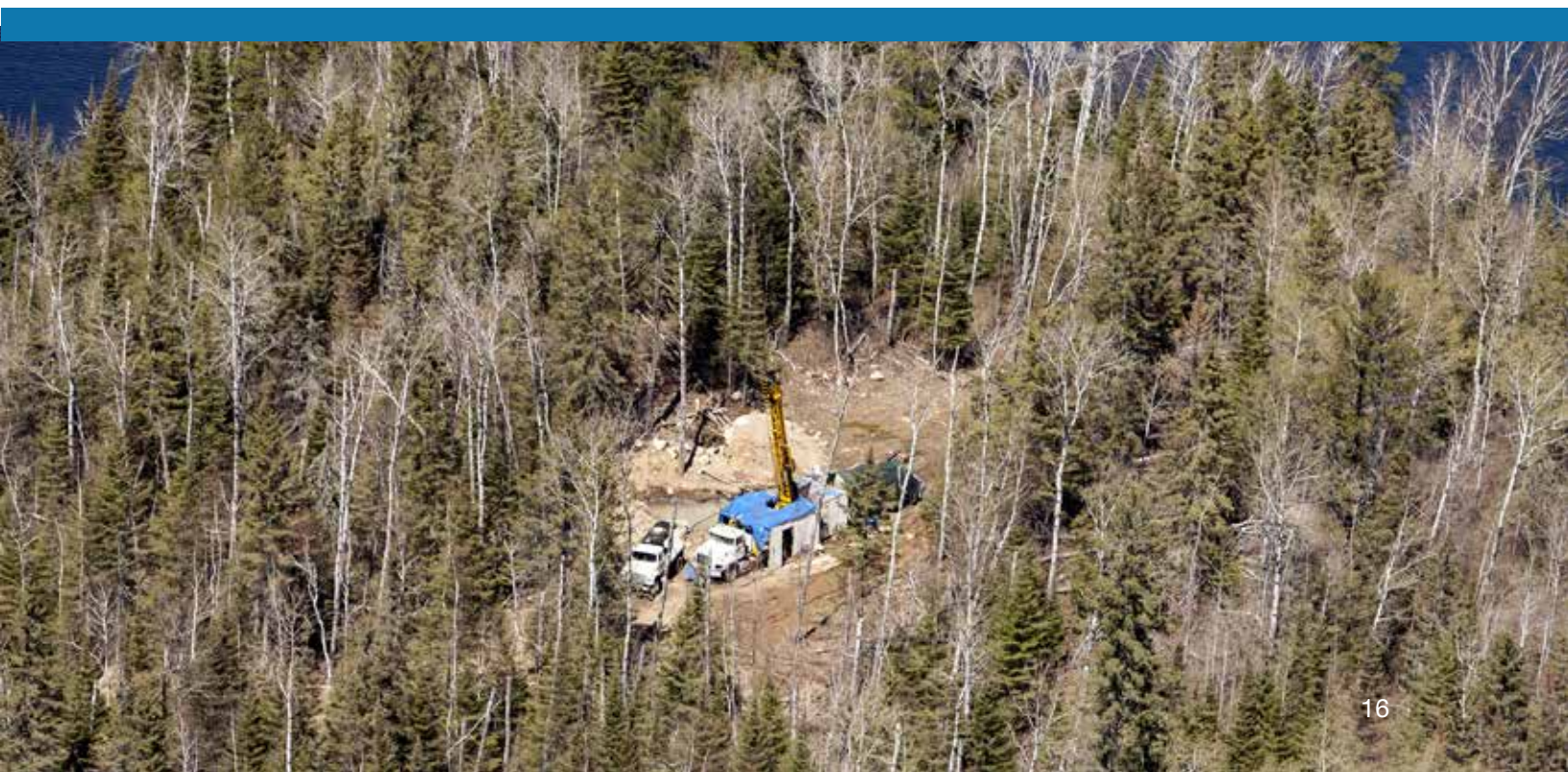




Figure 7: Casing extension for a drill hole.

Will core drilling affect my well?

The MDH rules that regulate exploration drilling are specifically designed to protect the quality of groundwater aquifers from any contamination. We know of no well that has been affected by our exploration drill holes. The requirements designed to protect groundwater include:

- Drill rigs must be registered and licensed by the MDH.
- Drill holes must have a casing that runs from above the surface of the land, through the various layers of rock and soil, and is sealed into bedrock. This is to ensure that no surface water or contaminants can enter the surface aquifer where most domestic wells draw their water.
- Only drilling additives that are State approved for core drilling are permitted to be used.
- The water used in the drilling process must be either potable, or if water from lakes or streams is used, must be treated to make it safe for protecting groundwater.
- Temporarily abandoned drill holes must have watertight casing, a watertight cap on the top of the casing, and the casing must extend one foot above the ground surface and at least five feet above the regional flood level (Figure 7).
- All drill holes must be permanently sealed with grout to protect groundwater.

What does IDEA do to protect against the spread of non-native invasive species (NNIS)?

IDEA takes the spread of NNIS very seriously and has protection policies in place to help control or prevent the spread of NNIS. All field employees apply a number of measures, including:

- No back-flushing water from any water tank back into any water source to avoid cross-contamination of aquatic invasive species. If it is necessary to empty a water tank, it is emptied in an upland area where no overland surface flow reaches water bodies or wetlands during back-flushing.
- Water from one stream or lake is not transferred into another.
- Avoid extracting organic and bottom material into water intakes when pumping from streams or ponds.
- Minimize driving equipment through or wading across water bodies whenever possible.
- If a water source is known to have NNIS present, that water source is avoided.
- Prior to movement onto a drill site, all off-road equipment (bulldozers, excavators, drill rigs) are cleaned such that the equipment is free of soil, seeds, vegetative matter, NNIS or their propagation structures (spores, eggs, etc.).
- Equipment is cleaned prior to moving equipment from a drill site known to be infested with NNIS to a new drill site.
- Sweep vehicle cabs and deposit refuse in waste receptacles regularly.

IDEA takes the spread of NNIS very seriously and has protection policies in place to help control or prevent the spread of NNIS.

Are drill holes sealed?

Yes. Mineral exploration drill holes are sealed in a manner similar to abandoned water wells. The sealing process is intended to prevent contamination of groundwater from surface water entering the drill holes or from water from one aquifer entering a different aquifer. Exploration drill holes are temporarily abandoned if there is a need to re-enter the hole in the future for additional testing procedures.

Holes may serve several purposes, which is why companies may want to only temporarily close the exploratory borings. For example, a hole used for providing a sample may be used to evaluate the rock structure by the use of a tele-viewer, an acoustic or optical camera that takes pictures of the hole walls to provide detail on rock structure. Sometimes, instruments that measure properties such as magnetism and rock conductivity are lowered into the drill hole to better understand the geology. Holes can also be used to evaluate the hydrology of the bedrock aquifer by injecting clean water and noting the response in that hole and others.

Exploration drill holes can be temporarily sealed, shown in Figure 7, for up to 10 years. When no additional information is needed from a drill hole, it is permanently abandoned according to State Rule 4727, which regulates the construction and sealing (either permanent or temporary) of exploratory borings and includes the requirement to submit sealing records to the MDH.

Can you leave a drill hole open so that a land owner can use it as a well?

No. Exploration drilling is regulated in Minnesota by the MDH through Minnesota Rule 4527. Part of that rule addresses this question:

“4727.0925 USE OF EXPLORATORY BORINGS. Subp. 2. Other uses. An exploratory boring must not be used for purposes regulated under chapter 4725, unless the boring is constructed according to that chapter by a person licensed or registered to construct the well or boring.”

Water wells are regulated under Minnesota Rule 4725 and IDEA is not a licensed water well driller. Consequently, the core holes we drill cannot be used as water wells.

INTERESTING FACT:

At many drill sites, IDEA uses large wooden platforms to help protect land surfaces. This is a best practice that exceeds Minnesota requirements.



What happens to the drill cuttings?

Drill cuttings are contained and reclaimed in an on-site sump or collected and transported to a central sump and reclaimed. Drill cuttings are the ground up rock from the drilling process, and the water and additives such as drilling fluid that are pumped down the drill hole to cool the drill bit and raise the cuttings to the surface. IDEA manages drill cuttings in accordance with Minnesota regulations. IDEA utilizes either recirculation tanks or temporary in-ground sump pits to contain drilling fluid, cuttings and water from the drilling process as surface conditions allow. Recirculation tanks are portable, above-ground and the drilling fluids and tanks are removed from the drill site when drilling is complete. Drill cuttings and additives are allowed to settle out of the drill water in the in-ground sump pits or recirculation tanks prior to re-circulating the water into the drill hole and prior to backfilling the sump.

Drill cuttings and fluids are not to be released into waterways under any circumstances. Acceptable techniques include dug sumps, tanks and other settling or filtration devices designed specifically for cuttings management. Upon completion of the drilling at each site, any in-ground sump pits are backfilled with clean soil materials, leveled, graded and otherwise restored to the condition that existed prior to the development of the drill site. The process of refilling the sump area when the drill site is reclaimed is designed to eliminate impacts on the environment. Figure 8 shows a reclaimed drill site.

Drill cuttings are regulated by Minnesota Rule 4727 that states:

"Drilling mud, cuttings, treatment chemicals, and discharged water must be disposed of according to applicable federal, state, and local requirements. Drilling mud, cuttings, treatment chemicals, and discharged water must not be disposed of in a manner that creates a health or environmental hazard."

INTERESTING FACT:

The sump area is also where water is stored for reuse in the drilling activity, which conserves water usage.



Figure 8: The mature reclaimed drill site shown here is difficult to identify, except for the remaining casing extension.

What about noise from the drill rigs?

We recognize that noise is a major concern from landowners, cabin owners, resort owners and campers that might be in an area where we are drilling. The Minnesota legislature has classified noise as a form of pollution and directed the Minnesota Pollution Control Agency (MPCA) to establish rules to control noise levels. The MPCA has set noise limits of 60-65 decibels during the day and 50-55 decibels at night for noise limits near homes or cabins. For reference, 50 decibels is similar in noise level to a moderate rainfall and 60 decibels is the level of normal conversation at 3 feet or a hand held electric mixer.

The United States Forest Service has conducted noise modeling specifically for drilling through the Environmental Review on mineral exploration in the Superior National Forest. The image on the left in Figure 9 below shows the results of their analysis with no noise mitigation measures.

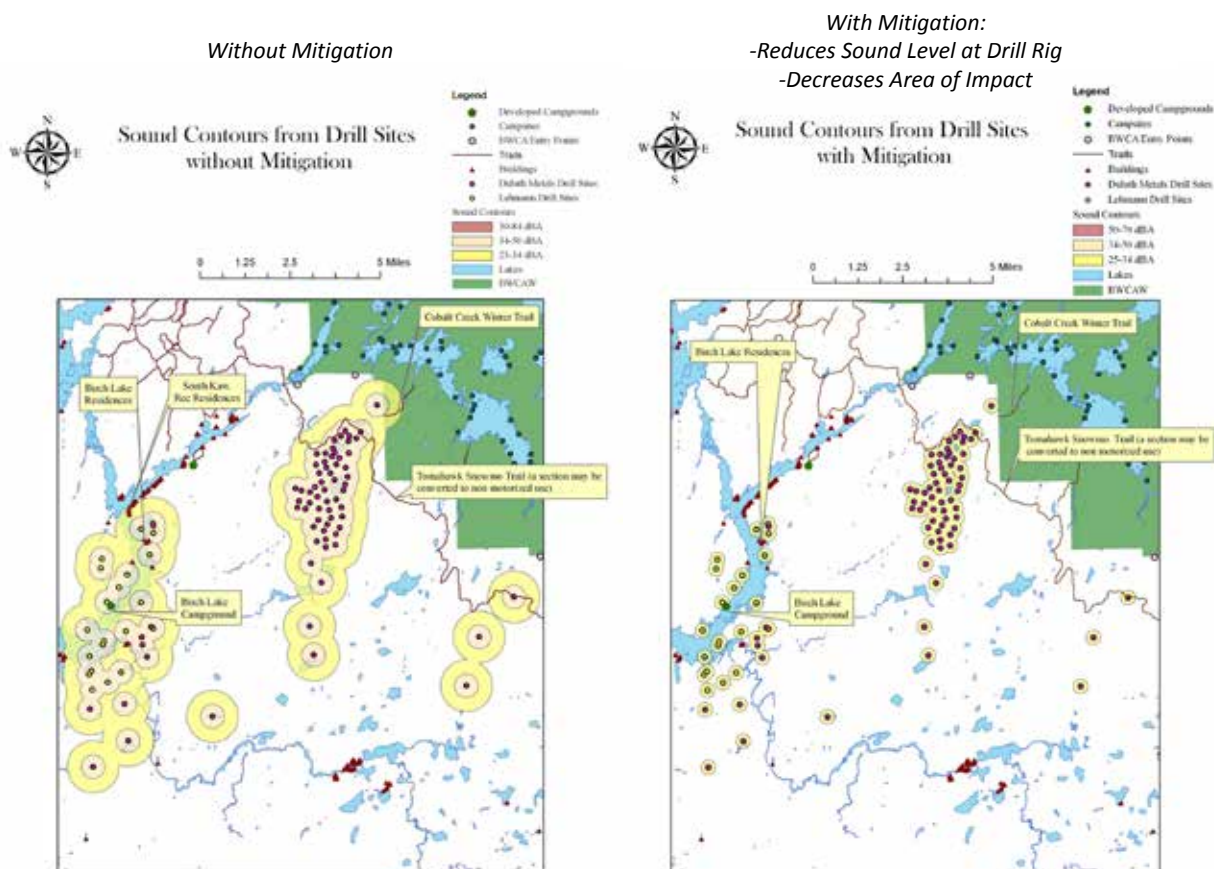


Figure 9: Image on the left shows sound contours without mitigation. The image on the right shows sound contours with mitigation.

IDEA has taken mitigation measures, in partnership with our customers, to achieve noise levels that are substantially below the limits set by the MPCA. IDEA utilizes high-efficiency mufflers, soundproof drapes covering drill rigs and numerous modifications to our operating procedures. With these mitigation measures in place, we have achieved noise levels of 40 decibels or less at 400 feet from our rigs. To put this in perspective, this noise level is similar to the refrigerator running in your kitchen. We continuously work to find ways to enhance our noise reduction practices. The image on the right in Figure 9 on the previous page shows the results of United States Forest Service analysis with mitigation measures taken from the Federal Hardrock Mineral Prospecting Permits EIS conducted on the Superior National Forest.



Additional Contact Information

The following listing has contact information for various topics should you want more information. There is also an appendix available on IDEA's website, www.ideadrilling.com, which provides additional information on the topics in this handbook.

Who do I talk to if I have more questions about drilling operations?

IDEA Drilling

<http://ideadrilling.com/>
1997 9th Avenue North
Virginia, Minnesota 55792
Telephone: 218.741.9287 or 888.634.IDEA
(ask for the president or the vice president of operations)
Fax: 218.741.9288

Minnesota Department of Health

<http://www.health.state.mn.us/index.html>
Central Office/Metro District
625 North Roberts Street
P.O. Box 64975
St. Paul, Minnesota 55164-0975
Telephone: 651.201.5000 or 800.383.0823
TTY: 651.201.5797

Minnesota Department of Natural Resources

<http://www.dnr.state.mn.us/>
Hibbing Office
1525 3rd Avenue East
Hibbing, Minnesota 55746
Telephone: 218.231.8484
Fax: 218.262.7328

Who do I talk to if I have more questions about geology or minerals in Minnesota?

Minnesota Geological Survey

<http://www.mnsgs.umn.edu/index.html>
2642 University Avenue West
St. Paul, Minnesota 55114-1032
Telephone: 612.627.4780
Fax: 612.627.4778

Natural Resources Research Institute

<http://www.nrri.umn.edu/>
University of Minnesota Duluth
5013 Miller Trunk Highway
Duluth, Minnesota 55811
Telephone: 218.720.4278
Fax: 218.720.4329

Minnesota Department of Natural Resources

<http://www.dnr.state.mn.us/>
Hibbing Office
1525 3rd Avenue East
Hibbing, Minnesota 55746
Telephone: 218.231.8484
Fax: 218.262.7328

Who do I contact at the State if I have questions or concerns about my rights as a land owner?

Minnesota Department of Natural Resources

<http://www.dnr.state.mn.us/>
Central Office
500 Lafayette Road
St. Paul, Minnesota 55155-4040
Telephone: 651.296.6157 or 888.646.6367
Email: info.dnr@state.mn.us
TTY: 651.201.5000
TTY: 800.657.3929

Minnesota Pollution Control Agency

<http://www.pca.state.mn.us/>
520 Lafayette Road
St. Paul, Minnesota 55155
Telephone: 651.296.6300 or 800.657.3864

Who can I contact if I have questions or concerns about drilling laws and regulations?

Minnesota Department of Health

<http://www.health.state.mn.us/index.html>
Central Office/Metro District
625 North Roberts Street
P.O. Box 64975
St. Paul, Minnesota 55164-0975
Telephone: 651.201.5000 or 800.383.0823
TTY: 651.201.5797

State Senator or Representative

<http://www.gis.leg.mn/OpenLayers/districts/>

